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ABSTRACT

A general interest in attrition, or loss of units from a study, stems in part from the observation that the infrequency of attention to attrition exacerbates problems of data interpretation. As a substudy of the national evaluation of Project Follow Through, the potential biasing effects of attrition of subjects from the sites were investigated. Policy attrition, the administrative dropping of a unit; program attrition, loss of subjects due to mobility, dislike of the treatment, etc.; and sample attrition, units omitted because of deficient data, have been defined, but were not distinguished in this research. The relationship between attrition, pretest score, and income level were studied. In the few cases where additional variance was accounted for by the interaction of pretest or income with treatment within-site, an interpretation of the possible biasing effects of attrition was made in the evaluation of the specific site. It is suggested that in cases where differential attrition is found, the offending variable be considered for use as a covariate. (BW)

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ATTRITION: IDENTIFICATION AND EXPLORATION IN THE NATIONAL FOLLOW THROUGH EVALUATION

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Introduction

One of the most important problems that is germane to the topic of social experimentation, educational evaluations, and especially to longitudinal studies is the issue of attrition, that is, the loss of units from a study. In a critique of educational evaluation studies including Sesame Street, Head Start, and Follow Through, Anderson (1973) suggested that additional information as to the nature of these programs be provided to assist the reader in interpreting the major conclusions. Such information, which has largely been omitted in the past, should include " . . . provision of data on dropouts in groups of subjects. (Failure to take account of differences in the number and kinds of dropouts in groups that are to be compared represents a major source of error in conclusions about the effects of educational treatments.)" (Anderson, 1973, p. 202).

While the significance of attrition problems was popularized by Campbell and Stanley (1963) in their identification of attrition as a "possible rival hypothesis," later work by Jurs and Glass (1970) revealed that mortaility estimates are seldom given in reports of educational studies, and that virtually no textbooks include attrition as a topic of interest. Although Kershaw (1971) gives suggestions for countering attrition in interview situations, and Reicken and Boruch (1975) as well as Jurs and Glass (1970) discuss various aspects of the attrition problem, it is clear from a review of educational studies that investigations of the effects of attrition on either the internal or external validity of educational studies are usually lacking.

Our general interest in attrition stems in part from the observation that the infrequency of attention to attrition exacerbates problems of data interpretation. We are concerned that the lack of a clear understanding of the causes and effects of attrition will inhibit the development of better evaluation technology and will obscure the identification of valuable educational and social programs.

In order to give the present paper a real world referent, we will orient the rest of the discussion around our experience with a study of attrition in the national evaluation of Follow Through, a large-scale

quasi-experimental program in compensatory education. Follow Through was implemented through an approach known as "planned variation" which included the systematic introduction of a variety of programs into the kindergarten through third grade years of public education by educational specialists (sponsors) from research institutions and universities who each implemented their own educational model in a group of school districts (sites)

The national evaluation of Follow Through, in which Abt Associates Inc. (AAI) has participated since July, 1972, is designed to examine the effects of different approaches to education for improving the performance of disadvantaged children in a variety of areas. The national evaluation has concentrated on examining data collected from groups of program participants (Cohorts) in each year since 1969. These data include tests administered to children, questionnaires submitted by teachers, and parent interviews. As a substudy, AAI has investigated whether attrition of subjects from the sites included in the national evaluation of Cohort II (subjects who entered Follow Through in fall, 1970) has biased that evaluation. Many of the ideas incorporated in the present paper originated in that study of attrition.

The "analytic sample" for the above-referenced Follow Through evaluation included a total of 5,519 children (3,369 treatment and 2,152 comparison) distributed across 17 sponsors, where each sponsor implemented its educational program in between one and seven sites and where each site contained a Follow Through treatment group (FT) and a non-Follow Through comparison group (NFT).

General Attrition Concerns

Before addressing the problems of identifying and explaining attrition in Follow Through, a discussion of some specific ways in which attrition might or might not have biased the Follow Through (or any other) evaluation may be helpful. Assume that the design discussed above holds, and that the "analytic sample" of children has been identified, and is smaller -- due to attrition -- than the initial evaluation sample. If

subjects who have not been retained in the analytic sample are different in some "important" way from those who have been retained, then the internal and external validity of the study may be called to question. To pursue this matter further, we may define three general cases. First, if dropouts in both the treatment and comparison groups are similar to each other, and to those who remained, then attrition is not a threat to the study. On the other hand, if the dropouts from both the treatment and comparison groups are similar to each other but are not representative of those who remain, the external validity of the study is weakened. Finally, if the treatment and comparison dropouts are not representative of the remaining subjects, and in addition are not similar to each other, both the internal and external validity of the study is questionable.

Stated in terms of the Follow Through evaluation, if in both the treatment and control groups low ability children have been retained while high ability children dropped out, our results would be interpretable in terms of low ability children, but we would not know the effects of the program on high ability children, i.e., our ability to generalize to the population represented by the entry group would be diminished. This does not mean that we cannot analyze the data on the retained sample, it is to say that the interpretability of such a primary analysis is limited. Turning to another example, if we were to find that low ability children dropped out of the treatment group, while high ability children dropped out of the comparison group, then the possibility of making valid statements as to the effectiveness of the treatment is limited. Again, this is not to say that the data cannot or should not be analyzed, rather that we must use the results of such an attrition finding to understand and perhaps qualify the results of the primary analysis.

Definition of Attrition

Although commonly thought of as the loss of subjects from an experiment due to mobility, death, dislike of the treatment, etc., the phenomenon of attrition may be defined in a number of ways. The definition developed for use in the Follow Through evaluation is a good deal more comprehensive than most, and consists of three major categories: Policy, Program and Sample.

Policy attrition is defined as the administrative dropping of a unit (at any level) after the initial implementation of a program. Within the Follow Through evaluation, this might mean the permanent cessation of data collection in an entire site, or within a single school in that site. Policy attrition may even occur at the child level if for instance the policy of a given school is to return all children whose academic performance has improved to a "regular" classroom in order to provide space for the more needy child.

Program attrition defines the types of subject behaviors that are generally thought of when attrition is mentioned. This includes the loss of subjects due to mobility, dislike of the treatment, illness or death, etc. It is difficult if not impossible at the child level to differentiate between policy and program attrition unless data have been specifically collected for that purpose. For example, it may not be possible to differentiate between a child being dropped out of the program because his academic performance improved and is no longer in need of the treatment, and the child who is dropped because his parents left town.

Sample attrition occurs within the office of the evaluator and/or data collector. Included in this category are subjects who are omitted from the analytic sample for any number of data deficiency reasons including an invalid test, a large amount of missing data, or inadequate cell size.

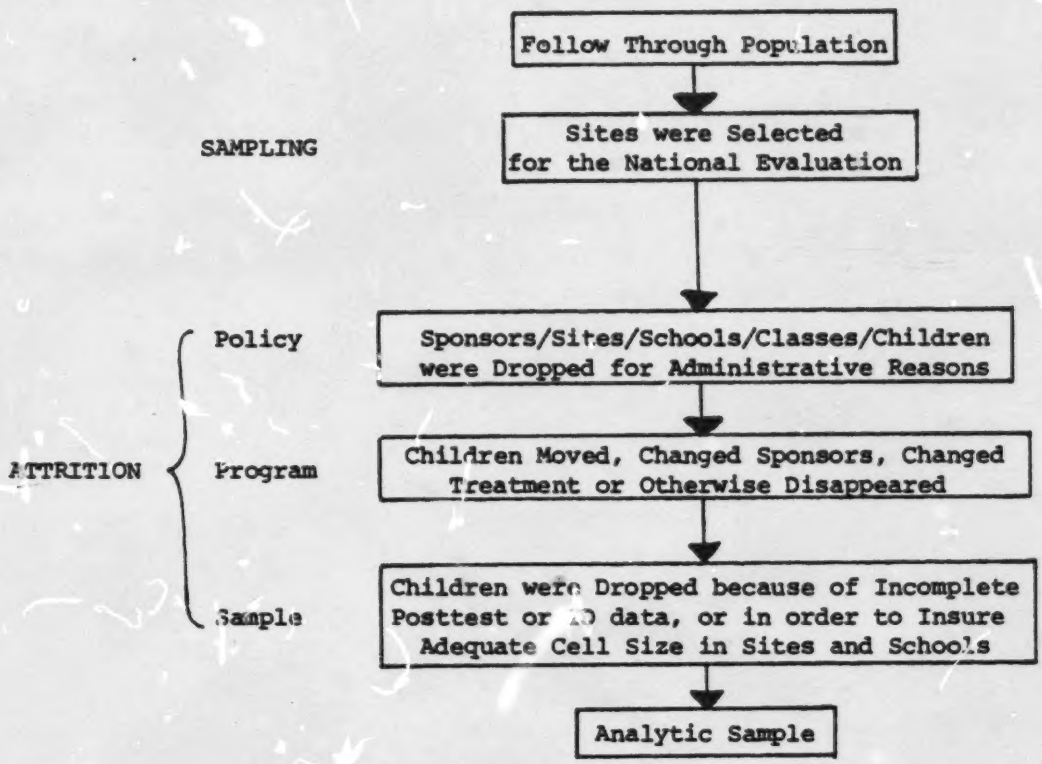
While we have conceptualized attrition as being of three major types, this year we have not distinguished between different types of attrition in our analyses. This was done because our primary concern has been to ascertain whether the analytic sample was representative of the sample which was present at the beginning of the program. In order to answer this question it was necessary to collapse across our attrition definitions. (See Figure 1.)

Analytic Model

This year within the Follow Through evaluation we chose to examine attrition by exploring its relationship with two measures - a pretest score and an income index - both of which were obtained during the first year of a child's participation in Follow Through. These two

FIGURE 1

Process by Which a Child Enters the Analytic Sample


Follow Through Population
SAMPLING
Sites were Selected for the National Evaluation
ATTRITION
Policy
Sponsors/Sites/Schools/Classes/Children were Dropped for Administrative Reasons
Program
Children Moved, Changed Sponsors, Changed Treatment or Otherwise Disappeared
Sample
Children were Dropped because of Incomplete Posttest or IQ data, or in order to Insure Adequate Cell Size in Sites and Schools
Analytic Sample

variables capture much of the essence of a host of available background measures and in addition are included as covariates in our primary analysis (an analysis of covariance model which compares FT and NFT posttest scores).

The data were analyzed in order to answer the following question: for a given sponsor, does the FT/NFT within-site difference in rate of attrition differ across levels of pretest or income? A hierarchical regression analysis was run for each sponsor to predict a dichotomous dependent variable (child was in the analytic sample vs. child was not in the analytic sample). The regression model was as follows:

$$Y = a_0U + b_1X_1 + (b_2X_2 + \ldots + b_iX_i) + (b_{i+1}X_{i+1} + \ldots + b_jX_j)$$
$$+ (b_{j+1}X_{j+1} + \ldots + b_kX_k) + (b_{k+1}X_{k+1} + \ldots + b_LX_L)$$

Where set A is composed of variables X_1 through X_k, set B is composed of variables X_{k+1} through X_L, and variables are defined as follows:

Y = dichotomous dependent variable

1 = not in the analytic sample

0 = in the analytic sample

a_0 = constant

U = unit vector

$b_1 \ldots b_L$ = regression weights for $X_1 \ldots X_L$

X_1 = pretest (or income)

$X_2 \ldots X_i$ = (number of sites - 1) orthogonal between-sites Helmert contrasts

$X_{i+1} \ldots X_j$ = (number of sites) orthogonally coded treatment within-site contrasts

.5 = FT

-.5 = NFT

$X_{j+1} \ldots X_k$ = interaction of X_1 and $X_2 \ldots X_i$

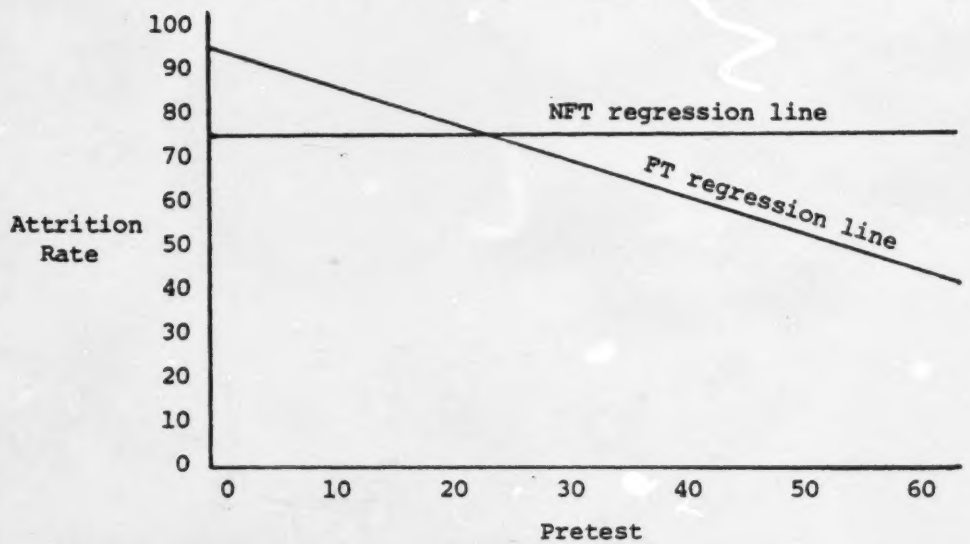
$X_{k+1} \ldots X_L$ = interaction of X_1 and $X_{i+1} \ldots X_j$

An F test was performed to determine the significance of the incremental variance added by set B, the last set of coefficients in the model ($b_{k+1} \ldots b_L$: the interaction of pretest with treatment within-site). If the overall F test proved non-significant, that is, if the set of interaction variables failed to add "significantly" to R^2 we proceeded no further. If, however, the interaction terms (set B) explained variance in the dependent variable, we examined the individual treatment within-site coefficients.

The major question we asked in our attrition study in Follow Through was whether the FT/NFT within-site difference in rate of attrition was different across levels of pretest and income. The answer, in most cases, was no. In the few cases where additional variance was accounted for by the interaction of pretest or income with treatment within-site an interpretation of the possible biasing effects of attrition was made in the evaluation of the specific site. For example, Figure 2 displays two hypothetical within-site regression lines of attrition rate on pretest. In such a site the attrition rate within FT is highest for lower scoring children and lowest for high scoring children, while the NFT rate of attrition is relatively constant across levels of the pretest.

FIGURE 2

Regression Lines of Attrition Rate on Pretest for FT and NFT Groups in a Hypothetical Site



We suggest that if one does find differential attrition that the offending variable be considered for use as a covariate. Assuming that the range of the variable has not been shifted and that the treatment and comparison groups have similar distributions on the variable, covariance will work toward the proper adjustment of the variable.

It is apparent that a full treatment of attrition requires that two types of data be collected. First, data on potential biasing variables must be available for both the dropouts and the remaining subjects. This implies that such data should be gathered as early as possible in the design/implementation of a program. Second, special data as to the nature of attrition and the reasons that a subject dropped out of a program must be collected if one is interested in exploring differences between different types of dropouts. It is our recommendation that such data be collected in all social science studies where attrition is likely to occur.

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